

REMARKS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-19 are currently pending, with Claims 4, 5, and 8-19 withdrawn as directed to a non-elected invention. Claims 1-3 have been amended by the present amendment. The changes to the claims were supported by the originally filed specification and do not add new matter.

In the outstanding Office Action, the Title of the Invention was objected to as not being descriptive of the invention as recited in the claims; Claims 35-40 were objected to as not including a legend such as "Prior Art"; Claims 1-3, 6, and 7 were rejected under 35 U.S.C. § 112, first paragraph regarding the phrase "through said trench" recited in Claim 1; Claims 1-3, 6, and 7 were rejected under 35 U.S.C. § 112, second paragraph, regarding the phrase "through said trench" recited in Claim 1; and Claims 1, 2, and 6 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,713,834 to Mori et al. (hereinafter "the '834 patent").

Applicants wish to thank the Examiner for the interview granted Applicant's representative on June 15, 2004, at which time a proposed amendment to Claim 1 was discussed. At the conclusion of the interview, the Examiner agreed that the proposed amendment would overcome the outstanding rejection of Claim 1. However, the Examiner also indicated that a further search of the prior art would be required upon formal submission of a response to the outstanding Office Action.

In response to the objection to the Title, the Title has been amended to be more descriptive of the invention recited in the claims. Accordingly, the objection to the Title is believed to have been overcome.

In response to the objection to the Drawings, Figures 35-40 have been amended to include the legend "Background Art". Accordingly, the objection to the drawings is believed to have been overcome.

Applicants respectfully submit that the rejections of Claims 1-3, 6, and 7 under 35 U.S.C. § 112, first and second paragraphs, are rendered moot by the present amendment to Claim 1. Claim 1 has been amended to delete the phrase "through said trench."

Regarding the Information Disclosure Statement filed June 23, 2003, Applicants note that the Form 1449 attached to the outstanding Office Action does not reflect that Reference AA has been initialed as being considered by the Examiner. Accordingly, Applicants respectfully request that the Examiner acknowledge Reference AA in a subsequent action.

Amended Claim 1 is directed to a semiconductor device, comprising: (1) a semiconductor substrate having a trench formed in a surface of said semiconductor substrate; and (2) an MIS (Metal Insulator Semiconductor) transistor including (i) a source region formed to face the surface in the semiconductor substrate, (ii) a drain region formed to face the surface in the semiconductor substrate, the drain region formed apart from the source region on an opposite side of the trench, (iii) a gate insulating film formed on at least a portion of the surface that is interposed between the source region and the drain region within the trench, and (iv) a gate electrode formed on the gate insulating film at least within the trench. Further, Claim 1 recites that first and second electric charge holding portions configured to hold an electric charge are formed in the gate insulating film with the trench interposed therebetween. Claim 1 has been amended for the purpose of clarification only and no new matter has been added.

Regarding the rejection of Claim 1 under 35 U.S.C. § 103(a), the Office Action asserts that the '834 patent discloses everything in Claim 1 with the exception of the first and second electric charge holding portions, but asserts that those regions would have been

obvious to one of ordinary skill in the art because the gate insulating film disclosed by the '834 patent "functions the same as the claimed invention."¹

The '834 patent is directed to a semiconductor device having a two-layered charge storage electrode. As shown in Figures 1A, 1B, 2A, and 2B, the '834 patent discloses a semiconductor device having source/drain regions 81-87 formed between respective isolation regions 21-24. The isolation regions are formed within trenches formed in the substrate 1. In addition, the '834 patent discloses that, in the spaces between the isolation regions, floating gates comprising first, second, and third conductors 41, 51, and 52, respectively, are formed below an insulation film 6 and a conductor/control gate 7. However, the '834 patent fails to disclose a gate insulating film formed on at least a portion of a surface of the substrate which is interposed between a source region and drain region within the trench, as recited in amended Claim 1. In this regard, Applicants note that the Office Action asserts that the claimed gate insulating film corresponds to the gate insulating film 6 disclosed by the '834 patent. However, the gate insulating film 6 disclosed by the '834 patent is not formed on a surface of the semiconductor substrate. Moreover, the gate insulating film 6 is not formed on a portion on the surface of the substrate that is interposed between the source region and the drain region within the trench. Although the source/drain regions disclosed by the '834 patent are located on opposite sides of a trench, the gate insulating film is not formed on any surface that is interposed between the source and drain region, as shown in Figures 1A, 1B, and 2B. As those figures indicate, the source and drain regions are located in separate horizontal layers from the layers that include the floating gates. Moreover, the gate insulating film disclosed by the '834 patent is not disposed within a trench at all. Rather, parts of the gate insulating film disclosed by the '834 patent lie above an isolation region that occupies the trench.

¹ See page 5 of the Office Action dated May 18, 2004.

In addition, Applicants note that elements 83, 84, and 87 shown in Figure 2A of the '834 patent are referred to as "source/drain regions." However, Applicants note that Figure 2A does not indicate that there is a trench in the substrate 1 between, e.g., source/drain regions 83 and 84. In contrast, amended Claim 1 recites a drain region formed apart from the source region on an opposite side of a trench.

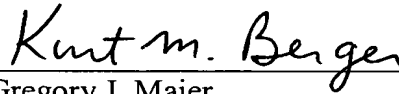
Further, the '834 patent fails to disclose a gate electrode formed on the gate insulating film at least within the trench. The '834 patent does not disclose that a gate electrode is formed within a trench. Finally, contrary to the assertion in the Office Action, Applicants respectfully submit that the '834 patent does not inherently include the claimed first and second electric charge holding portions configured to hold an electric charge because, as discussed above, the structure disclosed by the '834 patent is different from the structure disclosed by the invention recited in Claim 1. Accordingly, Applicants respectfully submit that the rejection of Claim 1 (and dependent Claims 2 and 6) is rendered moot by the present amendment to Claim 1.

Thus, it is respectfully submitted that independent Claim 1 (and dependent Claims 2, 3, 6, and 7) patentably define over the '834 patent.

Consequently, in view of the present amendment and in light of the above discussion, the outstanding grounds for objection are believed to have been overcome. The application as amended herewith is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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